

Carbon Nanotubes with High Reactive Surface

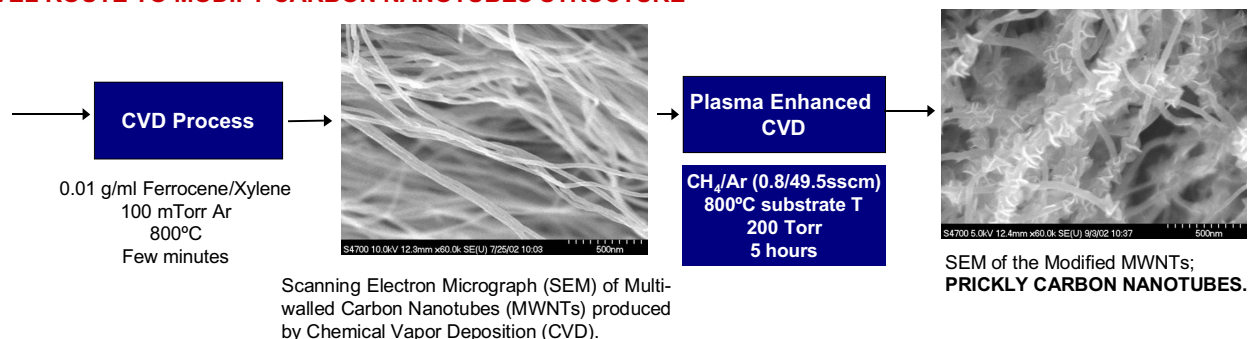
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Presently, carbon nanotube applications are still limited to simple prototypes. These limitations are related with

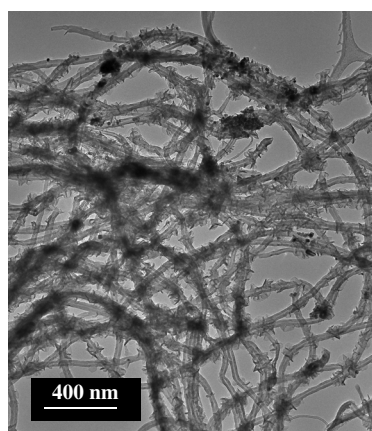
- The difficulty in obtaining large quantity of high purity samples
- Problems encountered when trying to manipulate the nanotubes and to integrate them in practical materials and systems.

The original approach here present, grafts graphitic nanostructures into the carbon side-walls using a two step-processes. The as-formed new complex structures (**PRICKLY NANOTUBES**) present **HIGHLY ACTIVE SURFACE** which could be used for a posterior functionalization and element intercalation. Their prickly structure should favor the composites and nanotube ribbon formation. Moreover the open graphitic structure of the branch increase the intercalation space for H storage.

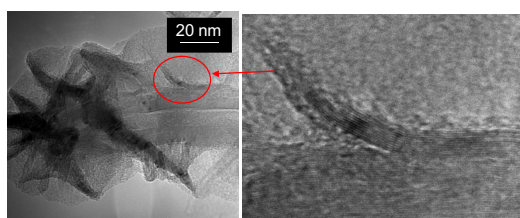
A NOVEL ROUTE TO MODIFY CARBON NANOTUBES STRUCTURE



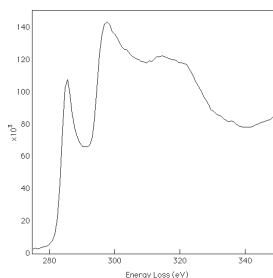
A NEW CARBON NANOTUBE MORPHOLOGY; PRICKLY CARBON NANOTUBES



Low magnification Transmission Electron Micrograph (TEM) of the modified nanotubes, show the presence of branches all along the nanotube. Such a new nanotubes morphology could be called as PRICKLY NANOTUBES.



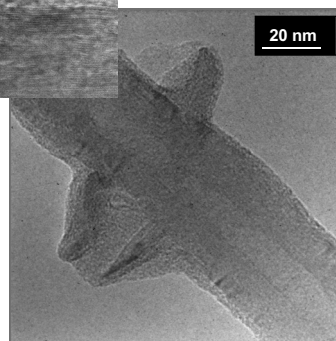
The nanotube-tip is where the strongest modification take place. The graphitic sheets are arranged like petals in a flower



C-K Electron Loss Near Edge Structure (ELNES) of the grafted structure shows their graphitic character.

Graphitic sheets are directly grafted to the outer walls of the nanotube.

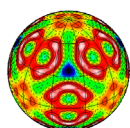
There is not a cavity on the carbon branch



"Prickly" nanotubes may provide:

- Improved field electron emission
- Enhanced electrochemical properties
- 1-2 orders of magnitude more active sites for attachment of functional groups (biomolecules, catalysts, etc.) and for element intercalation (such as Li and H storage)
- The new structure favors the composites and nanotube ribbon formation.

Graphitic wings on Carbon Nanotubes. S Trasobares et al. To be submitted in 2003



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This work was supported by National Science Foundation (NSF-NER). TEM imaging was performed using the facilities of the Electron Microscopy Center, Argonne National Laboratory.

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